



The U.S. Environmental Protection Agency's **ENERGY STAR® Homes Program** promotes the use of high-efficiency technologies and equipment. ENERGY STAR Homes use at least 30% less energy than homes built to meet the national Model Energy Code while maintaining or improving indoor air quality. These fact sheets are designed to help consumers learn more about the energy-efficient improvements to their ENERGY STAR Homes.

# RIGHT-SIZED/COMPACT DUCTS

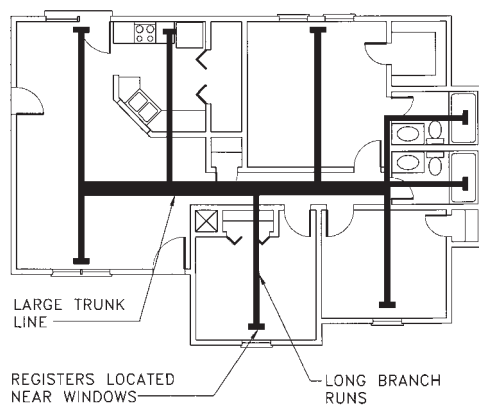
## AIR DISTRIBUTION SYSTEM IMPROVEMENTS

Air distribution system ducts are designed to supply conditioned air from space heating and cooling equipment to the living spaces and return an equal volume of air from the living spaces back to the heating and cooling equipment to be conditioned. However, ducts that are not properly sized and laid out can result in poor air distribution, bad indoor air quality, occupant discomfort, additional heat losses or gains, increased noise levels, and higher utility bills.

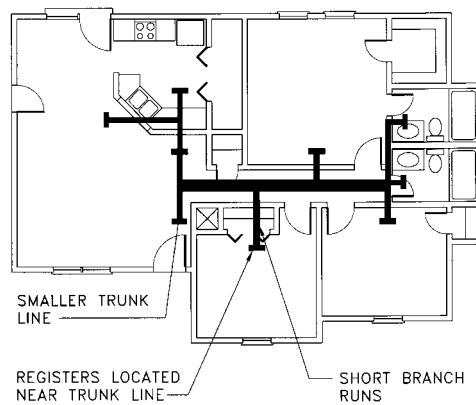
The major goal in duct design is to provide proper air distribution throughout a residence. In order to achieve this in an energy-efficient manner, the ducts must be sized and laid out to facilitate air flow and minimize friction, turbulence, and heat loss and gain.

The optimal air distribution system has "right-sized" ducts, minimal runs, the smoothest interior surfaces possible, and the least amount of direction and size changes. The overall design and construction of the building envelope will impact the duct system. Figure 1 shows standard residential construction practice where supply ducts are run to the perimeter of a house to offset drafts from cold exterior surfaces, especially windows. Figure 2 shows that ENERGY STAR Homes with tight construction, increased insulation levels, and high-performance windows do not need the expense of extensive duct runs. This is because wall, window, floor, and ceiling surface temperatures are warmer in winter and cooler in summer and drafts are eliminated.

**FIGURE 1: STANDARD AIR DISTRIBUTION SYSTEM**



**FIGURE 2: HIGH-EFFICIENCY AIR DISTRIBUTION SYSTEM**



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### RESOURCES

The following fact sheets are available by calling the U.S. Environmental Protection Agency's toll-free ENERGY STAR Hotline at 1-888-STAR-YES (1-888-782-7937): ***Duct Sealing, Duct Insulation, Locating Ducts Within Conditioned Space, Increased Insulation, and High-Performance Windows.***

***Bigger Is Not Better*** consumer brochure available from the Environmental Protection Agency's ENERGY STAR Hotline at 1-888-STAR-YES (1-888-782-7937).

### BENEFITS

Right-sized/compact ducts can provide many benefits including:

**Improved comfort.** Right-sizing ducts with a compact system layout helps to ensure that the proper amount of air is distributed to each room at a comfortable temperature. This can result in quicker recovery from night-time setbacks and a more consistent level of comfort throughout a house.

**Quieter home.** Supply registers, return air grilles, and ducts can be sources of unwanted noise within a residence. Undersized ducts can be noisy due to a high volume of air being pushed through an inadequate area. Properly sizing the ducts for required air flow improves the ability of the heating and cooling equipment to distribute air properly with minimum noise. This results in a quieter home.

**Lower equipment cost.** To compensate for the additional friction, dynamic losses, and heat losses or gains of an ineffective air distribution system, some builders install oversized, more costly heating and cooling equipment. In many cases, a right-sized, compact duct system is less expensive to install and can often allow for the installation of smaller, less costly heating and cooling equipment.